

### **REMARKS/ARGUMENTS**

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Claim 1 has been rejected under 35 USC 103(a) as unpatentable over Braun et al in view of Jones. Applicant respectfully traverses this rejection.

The concept of the invention is based on the principles of communicating vessels. According to the invention as defined in claim 1, and as illustrated by way of example in Figure 2 of this application, the system is formed by the following elements:

- a) dip leg (24) of secondary cyclone (22);
- b) dip leg (23) of the primary cyclone (21);
- c) point of junction (25) of the dip legs;
- d) bed of catalyst (9) into which the unique dip leg (26) formed by the junction of dip legs (23,24) from the cyclones (21,22) is immersed;
- e) open type termination (31) of the unique dip leg (26); and
- f) catalyst flows through the cyclones dip legs, which constitutes one of the variables that will define the level of catalyst into the components system.

The better sealing efficiency results achieved in accordance with the invention, which allow cyclones to be operated in series with high concentration of catalyst feed, is obtainable due to the existence of a catalyst level at a higher position than the position of the junction point of the dip legs that form the unique dip leg characterization applicant's invention. (See Figure 2), as now more specifically required by amended claim 1. Then, some operational conditions are appropriately observed, for example: pressure at the upper part of the primary cyclone is higher than the pressure at the top of the secondary cyclone.

The dip leg of the primary cyclone, due to the great amount of catalyst flow, can operate by using an open termination without incurring an efficiency loss of particles

collections. However, the dip leg of the secondary cyclone, due to low catalyst flow and pressure (about 1000 times less than the primary stage) conventionally demands sealing means (a plate for example). This constitutes a problem because it allows gas to escape without control to the interior of the dip leg.

The present invention represents an innovation as it proposes a solution to eliminate the sealing means for the dip leg of the secondary cyclone and to avoid those problems related to bad functioning and on stream failures (failure during operation), since this new manner of operating according to the invention is a self-control sealing system, provided that those conditions mentioned above are observed (i.e. positioning of the junction point combined with the open termination of the unique dip leg).

Thus, when the system of the invention is in operation, the level of catalyst must be above the junction of the dip legs and the pressure balance among the pressures resulting from catalyst flow into the cyclones (top of dip leg primary cyclone, top of dip leg secondary cyclone and termination of unique dip leg) appropriately equilibrated.

It is respectfully submitted that, in view of the foregoing, the configuration of the apparatus claimed is not a matter of choice since the improper configuration and disposition of the dip leg may lead to a collapse in the operation process, since the behavior of catalyst flow is different from the flow of a continuous fluid, such as for example a liquid.

Regarding Braun, the Examiner has characterized Braun as disclosing an apparatus comprising primary and secondary cyclones each terminating distally in a radius-curved termination that is devoid of movable sealing parts. As will be well understood from the Braun disclosure, Braun refers to a general fluid bed reactor ("a representative fluid bed reactor system is illustrated in Figure 1") and is silent regarding termination of the dip legs because it is not an objective of his invention. So whether the termination is provided with or without a seal is not important to Braun. In accordance with the present invention, on the contrary, the kind of termination

combined with the position of the dip leg junction point relative to the fluidized bed level is fundamentally important. Thus, the fact that there are no movable sealing parts disclosed or illustrated by Braun, does not mean that Braun teaches that there are no movable sealing parts. Braun is completely silent as to the nature and details of the termination. Even if Braun is construed as providing no movable sealing parts, Braun clearly does not teach or suggest the joinder of primary and secondary cyclones as specifically required by applicant's independent claim 1. Contrary to the examiner's characterization of Jones, Jones does not teach or suggest such a joinder either.

The Examiner cites column 1, lines 32-48 of Jones as allegedly teaching multiple cyclones discharging solids into a common dipleg. In the view of the inventor, an expert in this art, Jones does not teach the joinder of primary and secondary cyclones. Rather, what Jones says is that "Different arrangements of cyclones and different types of dip legs are in use. In some installations cyclones in multiple (more than one cyclone, which is the same thing as cyclones in parallel) are used discharging solids into a common dip leg. In others, cyclones in series or series-parallel (only in the case of arrangements of cyclones in series, as a unique group of cyclones in series or groups of cyclones in series) are used with individual dip legs". Thus, we can conclude that if arrangements of multiple cyclones (arrangements in parallel) are used, then a discharge of solids can be made by a common dip leg, in the case of arrangements of group of cyclones in series or arrangements of various groups of cyclones in series positioned in parallel, then individual dip legs are used to discharge solids. Thus, nothing is said by Jones regarding the joinder of dip legs of primary and secondary cyclones.

Accordingly, to the extent the passage in column 1 of Jones may be construed to teach multiple cyclones discharging solids into a common dipleg, it is respectfully submitted that this describes only the joining of diplegs of the same stage (parallel cyclones). As such, it is respectfully submitted that Jones does not teach or suggest the combination claimed, including joining diplegs of different stages.

The Examiner is correct when he says that it is easy to join, in a common dip leg, the discharge of multiple, parallel cyclones, because in this case all the devices operate under the same operational conditions and as a consequence all dip legs are in a fluid dynamic stable and equilibrium condition. However, the concept of joining dip legs of primary and secondary cyclones is a completely different matter which is not eluded to by Jones and would not obviously be undertaken because the efficiency of the system would be affected. It is respectfully submitted that the applicant was the first to propose, as defined in the present disclosure, the joinder of primary and secondary cyclones in the combination claimed.

Furthermore, the fact that Jones acknowledges that there are prior art installations where multiple cyclones discharge solids to a common dipleg does not mean *ipso facto* that Jones is advocating the provision of a radius curve at the termination of a separator leg which joins two diplegs. On the contrary, there appears to be two discrete teachings in Jones and no teaching of the combination advanced by the Examiner. Thus, Jones may teach that there are known installations where plural cyclones of a given stage discharge into a common dipleg, but it is in an entirely separate context that Jones discloses a curved dipleg end having a mechanical closure that is selectively released. Even if the Examiner construes Jones as allegedly teaching that his curved dipleg end could be provided as a common dipleg into which plural cyclones discharge (based on the prior art description in column 1), Jones still does not anticipate joining diplegs of different stages because, as noted above, the prior art Jones describes joins diplegs from the same stage.

Thus, Braun/Jones does not anticipate the combination claimed because neither Braun nor Jones teach, in combination, (1) a separator leg joining the leg of a secondary cyclone and the leg of a primary cyclone, (2) the level of the fluidized bed located above that junction; and (3) the separator leg terminates in a radius-curved separator leg termination that is devoid of movable sealing parts. Indeed, as noted above, the discussion of joining diplegs in column 1 refers to diplegs of a single stage

not joining diplegs of the primary and secondary stages, which is completely lacking in the applied art.

For all the reasons advanced above, it is respectfully submitted that claim 1 is not anticipated by nor obvious from Braun taken alone or in combination with Jones.

Claim 3 was rejected under 35 USC(a) as unpatentable over Braun in view of Jones and further in view of Danielsen. Applicant respectfully traverses this rejection.

Claim 3 is submitted to be patentable over Braun in view of Jones for the reasons advanced above. The Examiner's further reliance on Danielsen does not overcome the deficiencies of Braun in view of Jones noted above. In fact, Danielsen also teaches away from the invention by providing a movable sealing part at the distal end of the leg structure.

Section 103 does not allow the Examiner to engage in picking and choosing from the prior art only to the extent that it will support a holding of obviousness, while excluding parts of the prior art essential to the full appreciation of what the prior art suggests to one of ordinary skill in the art. In re Wesslau, 147 USPQ 391 (CCPA 1975).

It is therefore respectfully submitted that claim 3 is also allowable over the prior art of record.

Claims 4 and 5 were rejected under 35 USC 103(a) as unpatentable over Braun view of Jones and further in view of Luckenbach. Applicant respectfully traverses this rejection.

These claims are submitted to be patentable over Braun and Jones for the reasons advanced above. The Examiner's further reliance on Luckenbach does not overcome the deficiencies of Braun and Jones noted above. In fact, Luckenbach also teaches away from the claimed invention because Luckenbach discloses movable sealing parts in direct contradiction to the combination claimed in applicant's claim 1

and the claims dependent therefrom.

It is further respectfully submitted that Lukenbach does not teach or suggest that the radius curved portion of Braun/Jones could or should be formed from a plurality of straight pipe sections. In the case of Lukenbach, a single pipe part 14 is provided at an incline. Lukenbach does not teach that his inclined part is formed from a series of straight pipe sections; only a single pipe section is shown forming this component. Likewise, Lukenbach provides no teaching or suggestion whatsoever regarding using straight pipe sections to form a radius curve. In fact, if Lukenbach's teachings were followed in Braun/Jones, then Braun/Jones would provide a single straight segment at an incline as depicted in Lukenbach, rather than the single curved pipe. It is therefore, respectfully submitted that any proper combination of Braun/Jones and Lukenbach would still not anticipate nor render obvious the plural straight portions applicant claims in claims 4 and 5.

It is further respectfully noted that claim 5 provides that the succession of straight tube sections directs the mass flow against phase particles into a plane orthogonal to the ascending gas flow. This is not true of Jones as Jones clearly directs mass flow at an acute angle to and in the same direction as the gas flow, as understood from Figure 2. Thus, Jones does not teach or suggest a curve directing mass flow in a plane orthogonal to the gas flow direction. Lukenbach also fails to teach or suggest directing flow in a direction orthogonal to the gas flow because Lukenbach teaches mass flow directed downwardly at an acute angle to and in the opposite direction from the gas flow. Thus, any proper combination of Jones and Luckenbach does not anticipate nor render obvious claim 5 either.

It is therefore respectfully submitted that claims 4 and 5 are also patentable over the prior art of record.

Claims 1 and 6 were rejected under 35 USC 103(a) as being unpatentable over Owen et al in view of Jones. Applicant respectfully traverses this rejection.

Owen refers to Figure 1 as a representative form of the cyclone separation equipment. As can be seen, Owen mentions "separator 65 and 67 sequentially connected", that means cyclones in series – first and second stages". Also, regenerated catalyst separated by cyclones means 65 and 67 is conveyed by one or more catalyst dip legs 69 and 71 into a fluid bed", however Owen does not at any time describe the junction of the dip legs. The Examiner has concluded that dip legs of both cyclones were "combined" induced by Figure 1. Following the information of Figure 1, however, one can also conclude that the Owen inventive concept is different from applicant's, because the junction point of dip leg is above the fluid bed. If the apparatus disclosed by Owen were used in applicant's process it will not function. Besides that, the dip leg of Owen possesses movable sealing means at the leg termination.

The Examiner has considered that it is the intention of Owen to join dip legs of two cyclones in a unique dip leg immersed into fluid bed. According to the description of Owen, cyclones in series connected to the regeneration riser are necessary to promote the separation, but it is not clearly described that there exists a junction of the dip leg of a primary cyclone with dip leg of a secondary cyclone to form a unique complex dip leg for solids collection.

Regarding the observation of graphic representative form used for sealing means, The Examiner is correct. This kind of representation is normally attributed to trickle valves, which are not used in applicant's invention. Concerning the statement that "the cyclone leg in modified apparatus of Owen inherently directs the flow of descending mass of solids into a plane orthogonal to the ascending gaseous flow, by virtue of the total angle subtended by radius curve", this is not correct, since the representation form showed in Owen's Figure 1 points to the same direction of the legs "junction".

The Examiner's suggestion that Owen is "silent" as to the vertical distance between the junction and the discharge end is not well taken.

The performance of the apparatus of applicant's invention depends on the distance between the junction point and the distal end of cyclone leg termination, plus it requires that the junction point be also immersed in the fluid bed (see Figure 1 and claim 1). The following situations can occur:

- a) if this distance is too short, the efficiency of primary cyclone is not affected, but the efficiency of secondary cyclone is affected in such a manner that the whole system fails, and catalyst is thrown up into the environment;
- b) if this distance is too large, the fluid flow may be not established and the mass of catalyst, instead of returning to the fluid bed through the cyclone leg, bypasses the junction point towards the secondary cyclone;
- c) if this distance is large and the junction point is above the catalyst fluid bed the by-pass will occur also, since the sealing at the junction point fails;
- d) if restriction in the leg termination is not adequate, the invention will not function due to lack of catalyst mass for flowing (without restriction) or due to lack of flow (too restrictive).

The invention operates based on the pressure balance among the "communicating vessels", which comprise the fluidized bed, cyclones legs, junction point of the legs, and considering head loss of primary and secondary cyclones, catalyst level in the catalyst bed in relation to the junction point, and also, the type of leg termination.

As also noted by the Examiner, Owen provides sealing means at the termination of the dip legs. The Examiner relies on Jones as allegedly providing a termination that is devoid of movable sealing parts. Applicant respectfully disagrees for the reasons of record.



Indeed, Applicant respectfully submits that Jones does not teach the combination claimed devoid of movable sealing parts. Quite the contrary, Jones' invention specifically provides for a mechanical closure on a dip leg that is selectively released and, thus, expressly teaches a movable sealing part.

The Examiner asserts that Jones' sealing plate is only present when catalyst is introduced and is only temporary and will be removed during operation by the presence of a weight to pull a metal plate out of position or by forming the sealing means from a material that will partly or wholly fuse or rupture or disintegrate. However, the Examiner has by this admission acknowledged that Jones does teach a mechanical sealing part for the distal end of his dipleg and does teach that at least a part of the mechanical closure is movable. As such, Jones does not anticipate a distal termination that is devoid of movable sealing parts. Jones invention expressly provides for a mechanical closure placed on the dipleg and, thus, the invention is not anticipated. Indeed, it would be contrary to Jones invention to provide no sealing part.

Thus the invention is patentable over Owen/Jones because it would not have been obvious to simply eliminate the sealing means taught by Owen and provide the termination specifically recited in applicant's claims. Jones teaches a movable sealing means and thus does not meet the limitations of applicant's claim 1 even if combined with Owen. Moreover, that combination would not teach or suggest that the junction is provided below the level of the fluidized bed because clearly Figure 1 of Owen illustrates the junction above the level of the fluidized bed.

Even if the Owen terminus were changed to correspond to the terminus of Jones, Jones teaches the provision of a sealing component that has been disabled or removed. It is therefore respectfully submitted that the terminus recited in applicant's claim 1 is not taught or suggested by Owen when taken alone or in combination with Jones. But again, even if such a terminus were provided, as noted above, there would still be no teaching or suggestion of joining the diplegs of a primary cyclone and a

secondary cyclone to provide a single cyclone separator leg combining the outputs of the two different stage cyclones in the combination claimed by applicant.

In summary, Owen is not just silent as to the vertical distance between the junction and the discharge end, but provides no teaching or suggestion whatsoever in this regard. Even if Jones' removable closure plate and curved tip were applied to dipleg 41, neither Owen nor Jones provides any teaching whatsoever as to the position of the junction of the legs relative to the radiused/curved termination. Thus, it is submitted that claim 6 is patentable over Owen and Jones.

For all the reasons advanced above it is respectfully submitted that claims 1 and 6 are not anticipated by nor obvious from Owen taken alone or in combination with Jones.

Claim 3 is patentable as not having been obvious from Owen et al in view of Jones '191 and further in view of Danielsen.

Claim 3 is submitted to be patentable over the Owen/Jones combination for the reasons advanced above. The Examiner's further reliance on Danielsen does not overcome the deficiencies of Jones noted above. In fact, Danielsen also teaches away from the invention by providing a movable sealing part at the distal end of the leg structure.

It is therefore respectfully submitted that claim 3 is also allowable over the applied prior art.

Claims 4 and 5 is patentable as not having been obvious from Owen et al in view of Jones '191 and further in view of Luckenbach.

These claims are submitted to be patentable over Jones for the reasons advanced above. The Examiner's further reliance on Luckenbach does not overcome the deficiencies of the Owen/Jones combination. In fact, Luckenbach also teaches

away from the claimed invention because Luckenbach discloses movable sealing parts in direct contradiction to the combination claimed in applicant's claim 1 and the claims dependent therefrom.

It is further respectfully submitted that Luckenbach does not teach or suggest that the radius curved portion of Owen/Jones could or should be formed from a plurality of straight pipe sections. In the case of Luckenbach, a single pipe part 14 is provided at an incline. Luckenbach does not teach that his inclined part is formed from a series of straight pipe sections; only a single pipe section is shown forming this component. Likewise, Luckenbach provides no teaching or suggest whatsoever regarding using straight pipe sections to form a radius curve. In fact, if Luckenbach's teachings were followed in Owen/Jones, then Owen/Jones would provide a single straight segment at an incline as depicted in Luckenbach. It is therefore, respectfully submitted that any proper combination of Owen, Jones and Luckenbach would still not anticipate nor render obvious the plural straight portions applicant claims in claims 4 and 5.

It is further respectfully noted that claim 5 provides that the succession of straight tube sections directs the mass flow against phase particles into a plane orthogonal to the ascending gas flow. This is not true of Jones which clearly directs mass flow at an acute angle to and in the same direction as the gas flow. Thus, Jones does not teach or suggest a curve directing mass flow in a plane orthogonal to the gas flow direction. Luckenbach also fails to teach or suggest directing flow in a direction orthogonal to the gas flow because Luckenbach teaches mass flow directed downwardly at an acute angle to and in the opposite direction from the gas flow. Thus, any proper combination of Owen/Jones and Luckenbach does not anticipate nor render obvious claim 5 either.


It is therefore respectfully submitted that claims 4 and 5 are also patentable over the prior art of record.

RAMOS et al.  
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All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

Respectfully submitted,

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